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| **Lesson Title** | **Using Order of Operations to Evaluate and/or Simplify Expressions** |
| **Subject area/grade level** | **Mathematics Grades 5** |
| **Introduction** | A major focus of pre-algebra courses is the familiarize students with variable expressions. This lesson is a bridge between simplifying numerical expressions and evaluating algebraic expressions. |
| **Lesson Length** | 2 class periods (depending upon prerequisite knowledge and prior understandings) |
| **Materials** | Document Camera, Ground Works Shape Numbers Worksheet |
| **Lesson Overview** | Students will learn how to solve a problem using order of operations. They will learn how to use **P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally to remember the order of the order of operations. |
| **Tennessee Standards**  **MCS Power Standards** | **TN GRADE 5**  GLE 0506.3.1 Understand and use order of operations.  **MCS Grade 5**  Solve multi-step problems using whole numbers, mixed numbers, decimals and fractions. |
| **Lesson objective(s)** | The Learner will   * correctly verbalize order of operations * apply order of operations when solving a problem |
| **ENGAGEMENT**   * Describe how the teacher will capture students’ interest. * What kind of questions should the students ask themselves after the engagement? | Ask students to write down instructions to make a jelly sandwich; take them up and select one to follow. Follow instructions extremely literally and expect to make a mess. But take suggestions on how the directions should be amended to explicitly describe actions. Discuss “implied instructions” (such as, get bread implies you’ll have take the closure off the package, reach in and take a piece out) and “conventions” (such as putting jelly on bread requires spreading with a knife).  When does order of actions matter in math?  What kind of math problem has multiple steps?  How and when do we write action (operation) steps for computations?  Explain that we have need for these same types of communication and understanding in mathematics, i.e. there is an order to operations so that everyone gets the same value when evaluating a numerical statement. |
| **EXPLORATION**   * Describe what hands-on/minds-on activities students will be doing. * List “big idea” conceptual questions the teacher will use to encourage and/or focus students’ exploration | The students will work on a Ground Works Shape Numbers worksheet packet. Students have to use order of operations to fill in the numbers of the shapes. As students figure out one number it helps them to fill in other numbers. These are so fun (see attachment).  The teacher will ask questions such as: Which problem should we start with? One would need to begin with the easiest question possible. For example, On pg. 105, one would start with letter E, because it has all circles (see attachment). |
| **EXPLANATION**   * Student explanations should precede introduction of terms or explanations by the teacher. * What questions or techniques will the teacher use to help students connect their exploration to the concept under examination? * List higher order thinking **(HOT)** questions which teachers will use to solicit *student* explanations and help them to justify their explanations. | The teacher will call on students to come up to the document camera to share their answers. Students will have to explain how they got their answers, also. This is a question on each page. Therefore writing is integrated into math. |
| **ELABORATION**   * Describe how students will develop a more sophisticated understanding of the concept. * What vocabulary will be introduced and how will it connect to students’ observations? * How is this knowledge applied in our daily lives? | Students will share their explanation of how they solved the worksheet. Students will use correct vocabulary when discussing how they found their answers. Vocabulary may include: parenthesis, addition, subtraction, multiplication, exponents, and divide. This knowledge is applied in our lives when figuring out problems such as how much pizza to buy for a pizza party. One has to know how many students, how many pieces of pizza each can eat, how much it cost, etc. |
| **EXTENSION**  **INVOLVING TECHNOLOGY** | Use of the document camera |
| **EVALUATION**   * How will students demonstrate that they have achieved the lesson objective? * This should be embedded throughout the lesson as well as at the end of the lesson | The students will check and correct their papers, as students are called on to share how they got their answers. |